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Problems (Unclassified)

① Let $\bar{y} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ $[X] = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 1 \\ 3 & 1 & 2 \end{bmatrix}$ $[Y] = \begin{bmatrix} 0 & 1 & 0 \\ 2 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

a) Find $\bar{x} = [X]\bar{y}$

b) Find $\bar{x}^T = ([X]\bar{y})^T$

c) Find $[X][Y] = [Z]$

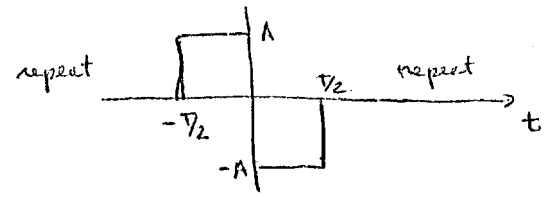
d) Find $[Y][X] = [W]$

e) Find $[Z] = [Y]^{-1}$

f) Find $\bar{y}^T [X] \bar{y}$

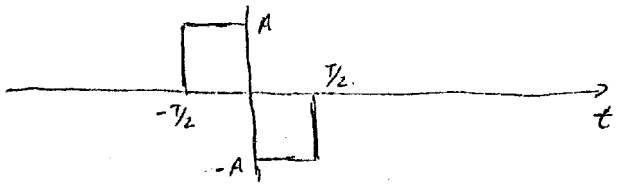
g) Find $\bar{y}^T y$

② Let $f(t)$ be given by.



Find the Fourier Series of $f(t)$

③ Let $f(t)$ be given by



a) Find the Fourier Transform of $f(t)$

b) Let $f_1(t) = f(t - T/2)$. Find the Laplace Transform of $f_1(t)$

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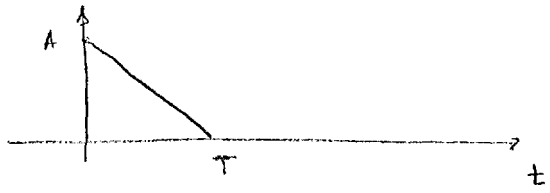
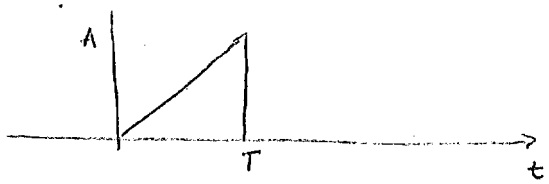
④ Suppose, $h(t)$ is given by.



and $g(t)$ is given by



a) Find $y(t) = h(t) * g(t)$. Sketch this result

b) Investigate $y(T)$. Show that for any $h(t)$ other than the above - call it $h_1(t)$,

$$y_1^2(T) = (h_1(t) * g(t))^2 \leq (h(t) * g(t))^2 = y^2(T)$$

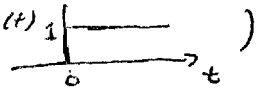
(Hint: use schwartz inequality)

⑤ Let

$$3\frac{d^2x}{dt^2} + 1\frac{dx}{dt} + 2x(t) = f(t)$$

a) Let $f(t) = \delta(t)$. Find the Laplace transform of the response i.e. determine the system transfer function.

b) Let $f(t) = u(t)$, a unit step. Find the Laplace transform of the response

(

)

c) From b) find the time response to a ~~unit~~ unit step

* d) From a) find the time impulse response. From this impulse response find the time response to a unit step by convolution. Compare with c)

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DPB ASSESSMENT

	71	72	73	74
ACM/DET	371	50	150	
NUC	177	90	200	
Prot/Class Mat	0	100 (CUT TO 30)	100	
ADP	132	130	100	
	680	370	550	600

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